

UNITED STATES DISTRICT COURT  
EASTERN DISTRICT OF NEW YORK

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MARY HOLLMAN, as the Administrator of the Estate of SAMUEL A. COX, and the Estate of SAMUEL A. COX, on behalf of JOHN COX,

Plaintiff,  
-against-

TASER INTERNATIONAL, INC.,

Defendant.

Docket No. 06-CV-3588(JFB)(ARL)

**DECLARATION OF JEFFREY HO.,  
M.D. AND EXHIBITS G-Q  
SUPPORTING TASER'S MOTION  
FOR SUMMARY JUDGMENT**

I, Jeffrey Ho, declare and affirm as follows:

1. I am a competent adult and have personal knowledge of the following facts.  
2. I am a board-certified attending emergency medicine physician at the Hennepin County Medical Center (“HCMC”) in Minneapolis, Minnesota. I completed my residency in emergency medicine at HCMC from 1992-1995, as well as a fellowship in emergency medical services (“EMS”) and pre-hospital care from 1995-1996. I am a Fellow of the American College of Emergency Physicians (“FACEP”) and the American Academy of Emergency Medicine (“FAAEM”). I have held an academic appointment as an assistant or associate professor of emergency medicine at the University of Minnesota School of Medicine since 1996.

3. HCMC is an urban Level 1 Trauma Center with an emergency department census of approximately 103,000 patients per year. HCMC is a teaching and research facility, and regularly teams with the University of Minnesota to conduct both private and government-sponsored medical research.

4. I also have substantial law enforcement experience. I obtained an associate of science degree in criminal justice and law enforcement in 2005, hold a full-time peace officer license in the State of Minnesota, and currently work as a deputy sheriff for Meeker County. I have previous experience as a police officer and firefighter/emergency medical technician. I served nine years in the military reserve as a medical corps officer, and currently serve as a medical director to several EMS agencies in the upper Midwest. I previously served as a medical director of an urban SWAT team, and regularly consult with law enforcement agencies and government on issues of in-custody death and electronic control devices (“ECDs”).

5. I currently serve as medical director and as an independent expert consultant to TASER International, Inc. (“TASER”) on arrest-related death issues, and have provided expert opinions and testimony on TASER® ECD effects on human subjects in several legal cases nationally and internationally. My expertise includes personal research in the area of sudden and unexpected death in law-enforcement related incidents, as well as the physiologic effects of ECDs on human subjects. I maintain a current TASER ECD instructor certification, and have personally received TASER ECD applications in both drive-stun and probe deployment modes on numerous occasions. I am a co-editor of the academic textbook *TASER® Electronic Control Devices: Physiology, Pathology, and Law*. Berlin: Springer Science Media (2009). I also authored chapters within the book on electrocardiographic effects of ECDs (Chap. 10) and serum and skin effects of ECD applications (Chap. 11).

6. Beginning in 2004, I have conducted extensive medical research on TASER ECDs, and have had my work published in peer-reviewed medical journals and presented at national and international meetings and assemblies. My original research and published works

have been in the areas of in-custody or arrest-related sudden death, and ECD testing concerning cardiac, respiratory, and blood chemistry results in numerous human studies.

7. Research funding at HCMC comes from a variety of private and government sources, including sometimes TASER. As a salaried employee of HCMC, I am not compensated for any research directly from TASER or any other source. Our research at HCMC is conducted by a team of doctors and scientists, many of whom have no connection whatsoever to TASER. Moreover, each research project requires approval of HCMC's Institutional Review Board and the Minneapolis Medical Research Foundation Conflict of Interest Committee. The publication process, which can take more than two and a half years, further subjects our methods and findings to rigorous scientific scrutiny.

8. Generally, once the research data is collected, an abstract is prepared and submitted for peer-review and acceptance for presentation at a scientific assembly. Once accepted for presentation, a "poster" or oral presentation is created and publicly presented at scientific research forums. I personally have been involved in more than 50 such presentations of ECD data. A formal paper usually is then prepared, submitted, accepted, peer-reviewed and finally accepted for publication.

9. Because ECDs involve the transmission of electrical charge, when theories of ECD temporally-associated deaths were first considered, the etiology most often entertained was one of electrocution. Observations in a porcine (swine) model study also raised concerns about whether ECD exposure to humans could compromise respiration. After these direct cardiac and respiratory concerns were vetted and debunked, additional theories turned to whether physiologic changes at the cellular level following ECD exposure might contribute to sudden death events. One popular plaintiffs' theory regarding potential secondary effects of a TASER ECD

application is that the ECD causes strong muscle contractions which may create lactic acid which might negatively affect pH balance and lead to sudden death. This appears to be Plaintiff's theory in this case. To date, however, no published research validates this highly speculative theory. Indeed, the relevant published literature directly contradicts it.

10. I have conducted and published significant research regarding potential secondary effects of ECD exposure to human physiology, and have consistently found no clinically significant changes in blood chemistry following ECD applications.

11. For example, I participated in a study using electrocardiography ("EKG") before, during and after probe deployment of a TASER X26™ ECD to 100 adults for either a 5-second or 10-second discharge cycle. As part of this study, we also collected blood serum at various intervals up to 24-hours after ECD exposure and found no evidence of elevated potassium (known as hyperkalemia) or induced acidosis. *See "Cardiovascular and Physiologic Effects of Conducted Electrical Weapon Discharge in Resting Adults,"* published by the Society for Academic Emergency Medicine ("SAEM") in 2006 (*Acad Emerg Med*, 2006;13:589-595).

12. My more recent publications involving metabolic acidosis and catecholamines include:

a. "Acidosis and Catecholamine Evaluation Following Simulated Law Enforcement "Use of Force" Encounters," published by SAEM in 2010 (*Acad Emerg Med*, 2010;17:E60-E68) and awarded the 2010 International Association of Chief of Police ("IACP")/Sprint Excellence in Law Enforcement Research Award at the IACP Annual Meeting on October 24, 2010. A true and correct copy of this article is attached as Ex. G. In this study simulating common arrest-related situations, test subjects were assigned to one of five task groups: (1) a 150-meter sprint and wall hurdle (simulated flight from arrest); (2) 45 seconds of

striking a heavy bag (simulated physical resistance); (3) a 10-second continuous TASER X26 ECD exposure in fired probe mode; (4) a fleeing and resistance exercise involving a law enforcement canine; or (5) an oleoresin capsicum (“OC”) exposure to the face and neck. Baseline serum pH, lactate, potassium, troponin I, catecholamines (epinephrine/norepinephrine/dopamine), and creatine kinase (“CK”) were evaluated. Serum catecholamines, pH, lactate, and potassium were sampled immediately after the task and every 2 minutes for 10 minutes post task. Vital signs were repeated immediately after the task. Serum CK and troponin I were evaluated again at 24 hours post task. The simulations of physical resistance and fleeing on foot led to the greatest changes in markers of acidosis and catecholamines. Results for the TASER ECD group were consistent with prior studies that showed minimal serum pH, lactate, and potassium changes and no associated troponin I elevations. The ECD also produced the lowest total catecholamine increase of all groups. The study concluded TASER ECD exposure may have less negative consequences for acidosis and catecholamine levels than physical resistance or allowing the subject to flee, and therefore may be a safer approach to restraint.

b. “Prolonged TASER [ECD] use on exhausted humans does not worsen markers of acidosis,” published in the American Journal of Emergency Medicine (“AJEM”) in 2009 (*Am J Emerg Med*, 2009;27:413-418). This article involved a 15-second continuous ECD probe application to already exhausted acidotic volunteers, and found no worsening acidosis (i.e., no further change in pH, lactate, etc.) in repeated blood serum biomarker evaluation. A true and correct copy of this article is attached as Ex. H.

c. “The neuroendocrine effects of the TASER X26 [ECD]: A brief report,” published in Forensic Science International (“FSI”) in 2009 (*Forensic Sci Int*, 2009;183:14-19). This study compared human stress response from a 5-second TASER X26 ECD probe exposure

to other pain generators (0°C cold water tank or OC pepper spray) or defensive tactics and canine capture drills. The test indirectly measured catecholamine levels through saliva via a protein enzyme biomarker (amylase) that elevates in conjunction with catecholamine release. The study data suggests that the human stress response is most activated by physical exertion from resisting custodial arrest or from fleeing from officers, and least activated by ECD application. A true and correct copy of this article is attached as Ex. I.

d. "Lactate and pH evaluation in exhausted humans with prolonged TASER X26 [ECD] exposure or continued exertion," published by FSI in 2009 (*Forensic Sci Int*, 2009;190:80-86). This study used blood sampling to compare acidosis levels in exhausted subjects who were allowed to continue to exert themselves versus receiving a 15-second continuous TASER X26 ECD probe application, and concluded the ECD application did not worsen acidosis any differently than those allowed to continue to struggle. A true and correct copy of this article is attached as Ex. J.

13. These results and conclusions are consistent with human studies by others, including those funded by the U.S. Department of Justice National Institute of Justice ("NIJ"). True and correct excerpts of the NIJ study "Safety and Injury Profile of Conducted Electrical Weapons Used by Law Enforcement Officers Against Criminal Suspects," published in April 2009 (*Annals of Emerg Med*, 2009;53(4):480-89) are attached as Ex. K. This study examined existing literature regarding the physiologic and cardiovascular effects of ECD applications in humans and found "no evidence of dangerous respiratory or metabolic effects using standard (5-second), prolonged (15-second), and extended (up to 45-second) conducted electrical weapon discharges." The NIJ study identifies 20 other ECD studies conducted on human volunteers in 2006-08, many of which included metabolic laboratory tests to evaluate potential secondary

effects on blood chemistry, all with similar non-dangerous findings. *See* Ex. K at 480, 486. I am unaware of any published study to the contrary.

14. In addition to the above-referenced publications, I have presented the following “posters” relating specifically to ECD drive-stun applications at various professional assemblies: (1) “Prolonged TASER [ECD] ‘Drive Stun’ Exposure in Humans Does Not Cause Worrisome Biomarker Changes,” June 2008 Canadian Association of Emergency Physicians Annual Meeting and January 2008 National Association of EMS Physicians Annual Meeting; (2) “Cardiac and Diaphragm ECHO Evaluation During TASER Device Drive Stun,” July 2008 ACEM Annual Meeting and September 2008 National Association of Medical Examiners Annual Meeting; and (3) “TASER [ECD] Wound Progression in Two Deployment Modes,” February 2009 American Academy of Forensic Sciences Annual Meeting. True and correct copies of these posters are attached as Ex. L.

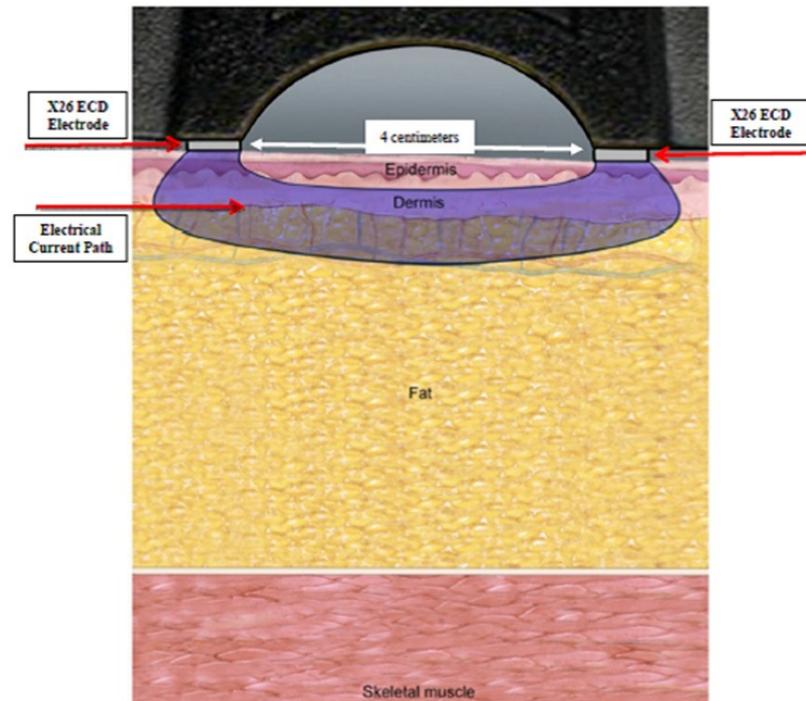
15. The bottom line of all of these studies is that ECD exposure in humans does not worsen acidosis that is already present regardless of deployment mode or duration. Most human ECD studies have focused on applications in probe-deployment mode because such methodology should yield worst-case scenario results due to the greater separation distance of the electrical current contact points. As reflected in the posters identified in paragraph 14 above, however, I have also conducted research specific to TASER ECD drive stuns. *See also* “Confirmation of Respiration during Trapezial Conducted Electrical Weapon [drive stun] Application,” published by the SAEM in 2008 (*Acad Emerg Med*, 2008;15:398).

16. An ECD drive-stun application is much less intrusive than a probe deployment and produces substantially less significant physiological effects. Accordingly, based on the studies discussed above showing no clinically significant changes in blood chemistry following

ECD applications in probe mode, it is clear an ECD drive stun also would not result in any clinically significant changes in blood chemistry.

17. ECD drive-stun injuries are typically limited to superficial localized burns that do not extend below the epidermis and dermis layers of the skin. Moreover, because the electrical current in an ECD drive-stun application passes between 2 fixed electrodes only 4 centimeters (1.6 inches) apart on the surface of the skin, it affects a very limited area, does not create any major body mass involvement, and does not result in Neuro-Muscular Incapacitation (“NMI”). Therefore, acidosis theories involving probe-mode applications (where the ECD causes strong muscle contractions and results in NMI) are simply not transferable to ECD drive stuns.

18. The illustration below depicts a drive-stun application to a person’s skin, and may accurately reflect the path of the electrical current between the two fixed electrodes on the ECD. The current only penetrates the outermost layers of the skin, the epidermis and the dermis, and dips slightly into the underlying fat layer. None of the current reaches the skeletal muscle.



19. In drive-stun mode, an ECD is merely a pain compliance tool. However, it is clear individuals in the midst of a psychotic episode do not perceive pain in the same manner as a normal person, and are often described as being impervious to pain. It is undisputed here that John Cox was in the midst of such an episode when he encountered police on April 22, 2005, and that the ECD applications appeared to have no effect on him. But even if the drive stuns caused Mr. Cox some pain, there is no medical or scientific evidence that such pain alone or in combination with the momentary flinching or recoiling of muscles to move away from the source of the pain could possibly worsen a person's acidosis.

20. No medical or scientific evidence exists today that multiple ECD drive-stun applications cause any clinically significant adverse physiological effects in humans, let alone contribute to a person's sudden death. Because the human body does not act as a capacitor or store electrical energy, multiple ECD applications do not have a cumulative effect.

21. No published peer-reviewed article or study has ever suggested that an ECD drive stun directly causes any injury beyond minor contact burns. Indeed, after conducting a literature review of thousands of volunteers and individuals in police custody who had received ECD drive stuns "with no untoward effects beyond local skin effects," the American Academy of Emergency Medicine ("AAEM") released a Clinical Practice Statement dated July 12, 2010 that medical screening of patients post ECD drive stun "should focus on local skin effects at the exposure site, which may include local skin irritation or minor contact burns." A true and correct copy of the AAEM Clinic Practice Statement, now published as "Emergency Department Evaluation after Conducted Energy Weapon Use: Review of the Literature for the Clinician," *J Emerg Med* 2011;40(5):598-604, is attached as Ex. M.

22. In August 2004 there was no generally accepted or prevailing view in the medical or scientific community that ECD drive stuns posed any significant health risk. I am unaware of any testing, study or report in the public domain at that time (or even today) suggesting that multiple ECD drive stuns, regardless of duration or application in rapid succession, could adversely affect a person's blood chemistry to any clinically significant degree.

23. Criticism that volunteer studies are not realistic because they are conducted on healthy individuals without psychiatric, cardiac or drug-related complications is unfounded. TASER ECDs have been on the market since 1994, have incorporated NMI technology since 1999, and have been studied more than any other law enforcement tool. In addition to volunteer studies, numerous studies of actual ECD field use by law enforcement have now been peer reviewed and published, including my own, and do not support ECD injury findings any different than the controlled volunteer testing.

24. For example, the NIJ study discussed in paragraph 13 above also examined actual ECD use in the field on 1,201 criminal suspects in six U.S. law enforcement agencies over a 36-month period. *See* Ex. K at 480. As noted in the study, these suspects had a wide variety of medical and psychiatric conditions, and nearly half (49.5%) involved documented alcohol or drug intoxication. *Id.* at 1, 4. More than 200 of these subjects were transported to a hospital for medical or psychiatric evaluation, yet, the study found mild or no ECD injuries in 99.75% of the cases. *Id.* at 480, 483.

25. A separate NIJ study published in July 2010, "Multi-Method Evaluation of Police Use of Force Outcomes," examined more than 24,000 use-of-force incidents in the field across twelve law enforcement agencies and found a suspect's risk of being injured actually *decreased* by almost 60% when an ECD was used instead of hands-on physical force. True and correct

excerpts from this study are attached as Ex. N. The study found that “in very rare cases, people have died after being pepper sprayed or shocked with a [TASER ECD], although no clear evidence exists that the weapons themselves caused the deaths.” *See* Ex. N at 8-3, 8-4.

26. As a law enforcement officer, EMS director and emergency room physician at a major metropolitan trauma center, I have significant experience with mentally ill and psychotic individuals. I care for hundreds if not thousands of these patients each year in my emergency medicine practice. I also participated in and am an author of a peer-reviewed article published in the AJEM in 2007 (*Am J of Emerg Med*, 2007;25(7):780-85) titled, “Impact of conducted electrical weapons in a mentally ill population: a brief report.” A true and correct copy of this article is attached as Ex. O. This study analyzed 2,452 ECD field uses on mentally ill and suicidal subjects over a six-year period, and found no connection between ECD use in mentally ill persons and their subsequent death.

27. To date, no peer-reviewed literature has ever linked TASER ECD exposure to an increased risk of sudden death. Instead, sudden in-custody death studies have found that such deaths primarily occur, whether a TASER ECD is used or not, in persons with a certain demographic and behavior profile, specifically, middle-aged males exhibiting agitated, bizarre behavior generally following illicit drug abuse. A true and correct copy of “Unexpected Arrest-Related Deaths in America: 12 Months of Open Source Surveillance,” published by the Western Journal of Emergency Medicine in May 2009 (*West J Emerg Med* 2009;10:68-73) attached as Ex. P. *See also* “Excited Delirium,” *West J Emerg Med* 2011;12(1):77-83 (describing classic sudden death characteristics as “bizarre and/or aggressive behavior, shouting, paranoia, panic, violence toward others, unexpected physical strength and hyperthermia” precipitated by stimulant drug use, and stating “[n]o study thus far has been able to demonstrate a causal

relationship between [TASER ECD] use and subsequent individuals' deaths."'). A true and correct copy of this article is attached as Ex. Q. Mr. Cox displayed all of these characteristics independent of any ECD application.

28. I hold all of the opinions stated herein to a reasonable degree of medical certainty or probability.

29. Pursuant to the authority of 28 U.S.C. § 1746, I declare under penalty of perjury that the foregoing is true and correct.

EXECUTED this 12<sup>th</sup> day of April, 2012 at Minneapolis, Minnesota.



Jeffrey D. Ho, MD, FACEP, FAAEM

**CERTIFICATE OF SERVICE**

I hereby certify that on April 16, 2012, the foregoing document was filed with the Clerk of the Court and served in accordance with the Federal Rules of Civil Procedure, and/or the Eastern District's Local Rules, and/or the Eastern District's Rules on Electronic Service upon the following parties and participants:

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/s/ John V. Tait  
John V. Tait (JT 4835)